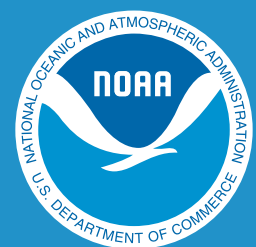




NOAA Scientific Publications Report



JANUARY 16, 2013

HIGHLIGHTED ARTICLE

Income diversification and risk for fishermen

Decision making for ecosystem based management: evaluating options for a krill fishery with an ecosystem dynamics model

Long-term decline of the western Pacific leatherback, *Dermochelys coriacea*; a globally important sea turtle population

ADDITIONAL ARTICLES

Broad salinity tolerances as a refuge from predation in the harmful alga *Heterosigma akashiwo* (Raphidophyceae)

Spatial and temporal variability of Alexandrium cyst fluxes in the Gulf of Maine: Relationship to seasonal particle export and resuspension

Differences in the toxicity of six *Gambierdiscus* (Dinophyceae) species measured using an *in vitro* human erythrocyte lysis assay

OTHER REPORTS, BOOK CHAPTERS, & INTERNAL PUBLICATIONS

National Coastal Population Report

Thunder Bay National Marine Sanctuary Condition Report

California Coastal Chinook salmon: status, data, and feasibility of alternative fishery management strategies

Income diversification and risk for fishermen

- Diversifying fishing activity across multiple fisheries or regions can substantially reduce the variability of income for individual fishermen and therefore their financial risk.
- Catch share programs often result in consolidation initially and may reduce diversification of both the vessels remaining in the program and those that have exited.
- It may be desirable to create management systems that allow fishermen to diversify while ensuring that total catches are constrained to sustainable levels.

Catches and prices from many fisheries exhibit high interannual variability leading to variability in the income derived by fishery participants. The economic risk posed by this may be mitigated if individuals participate in several different fisheries, particularly if revenues from those fisheries are uncorrelated or vary asynchronously. We constructed indices of gross income diversification from fisheries at the level of individual vessels and find that the income of the current fleet of vessels on the US West Coast and in Alaska is less diverse than at any point in the past 30 years. We also find a dome-shaped relationship between the variability of individuals' income and income diversification which implies that a small amount of diversification does not reduce income risk, but higher levels of diversification can substantially reduce the variability of income from fishing. Moving from a single fishery strategy to a 50-25-25 split in revenues reduces the expected coefficient of variation of gross revenues between 24% and 65% for the vessels included in this study. The increasing access restrictions in many marine fisheries through license reductions and moratoriums have the potential to limit fishermen's ability to diversify their income risk across multiple fisheries. Catch share programs often result in consolidation initially and may reduce diversification. However, catch share programs also make it feasible for fishermen to build a portfolio of harvest privileges and potentially reduce their income risk. Therefore, catch share programs create both threats and opportunities for fishermen wishing to maintain diversified fishing strategies.



AUTHORS

Watters GM (NMFS/SWFSC), Hill SL, Hinke JT (NMFS/SWFSC), Matthews J, Reid K

PUBLICATION DATE

Early 2013

TITLE

Decision making for ecosystem based management: evaluating options for a krill fishery with an ecosystem dynamics model.

JOURNAL
Ecological Applications

SIGNIFICANCE

- NOAA Fisheries scientists and colleagues from around the world have invested in a long-term effort to help manage the Antarctic krill fishery by modeling how the major components of the Scotia Sea ecosystem, their main prey (Antarctic krill), and the krill fishery, respond to proposed fishery management actions.
- This study measures the risk that specific management objectives relating to ecosystem productivity, health, resilience and services, would not be met for each of the fishing management actions.
- The results demonstrate that, even under conditions of substantial uncertainty, ecosystem models can help identify management actions that are robust to uncertainty.

SUMMARY

Ecosystem Based Management (EBM) relies on scientists to predict the consequences of decisions for multiple, potentially conflicting, objectives. The Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) requires managers of Southern Ocean fisheries to sustain the productivity and performance of fisheries, and ecosystem health and resilience. The managers of the Antarctic krill fishery in the Scotia Sea and southern Drake Passage have requested advice on management measures consisting of a regional catch limit and options for subdividing this amongst smaller areas. The authors developed a spatial ecosystem model that simulates krill-predator-fishery interactions and reproduces past dynamics. They worked with experts and stakeholders to identify (1) key uncertainties affecting our ability to predict ecosystem state; (2) illustrative reference points that represent the management objectives; and (3) a clear and simple way of conveying results to decision makers. The developed ecosystem model emphasizes uncertainty and summarizes the potentially complex results as estimates of the risk that a given objective will not be achieved, to allow direct comparisons between objectives. It also demonstrates that a candid appraisal of uncertainty (in the form of risk estimates) can aid, rather than hinder, understanding and use of ecosystem model predictions. Management measures that reduce coastal fishing, relative to oceanic fishing, reduce risks to both the fishery and the ecosystem. However, alternative objectives could alter the perceived risks, so further stakeholder involvement is necessary to appropriately represent their objectives.



Krill Fishery

AUTHORS

Tapilatu R.F., Peter H. Dutton (NMFS/SWFSC),
Manjula Tiwari (NMFS/SWFSC), Thane Wibbels, Hadi
V. Ferdinandus, William G. Iwanggin, and Barakhiel H.
Nugroho

PUBLICATION DATE

Spring/Summer 2013

TITLE

*Long-term decline of the western Pacific
leatherback, Dermochelys coriacea; a
globally important sea turtle population*

JOURNAL
Ecosphere

SIGNIFICANCE

- The leatherbacks nesting at Bird's Head Peninsula, Papua Barat, Indonesia, account for 75% of the total leatherback nesting in the western Pacific, and represent the last sizeable nesting population in the entire Pacific.
- There is an urgent need for continued and enhanced conservation and management efforts to prevent the collapse of what might be the last remaining stronghold for leatherbacks in the Pacific

SUMMARY

Sporadic nest counts at Jamursba Medi Beach at Bird's Head, have indicated a declining trend from the 1980's through 2004, although a relatively high amount of nesting has recently been documented at Wermon Beach, located 30-km east of Jamursba Medi. We used expanded year-round nesting surveys from 2005- 2011 at these two primary nesting beaches to obtain more robust estimates of the nesting population size and to evaluate long-term nesting trends. We found a 29% decline in nesting at Jamursba Medi and a 52% decline at Wermon from 2005 through 2011. We found that the estimated annual number of nests at Jamursba Medi has declined 78.2% over the past 27 years (5.5% annual rate of decline) from 14,522 in 1984 to 1,532 in 2011. Nesting at Wermon has been monitored since 2002, and has declined 62.8% (11.6% annual rate of decline) from 2,994 nests in 2002 to 1,292 in 2011. Collectively, our findings indicate a continual and significant long term nesting decline of 5.9% per year at these primary western Pacific beaches since 1984. The persistent and long term decline we report for the Bird's Head leatherback population follows other dramatic declines and extinctions of leatherback populations throughout the Pacific over the last 30 years.

PRESS RELEASE

Roll out plan: Yes



AUTHORS

Strom SL, Harvey EL, Fredrickson KA, Menden-Deuer S (NOS/NCCOS)

PUBLICATION DATE

Published online November 2012

TITLE

Broad salinity tolerances as a refuge from predation in the harmful alga 'Heterosigma akashiwo' (Raphidophyceae)

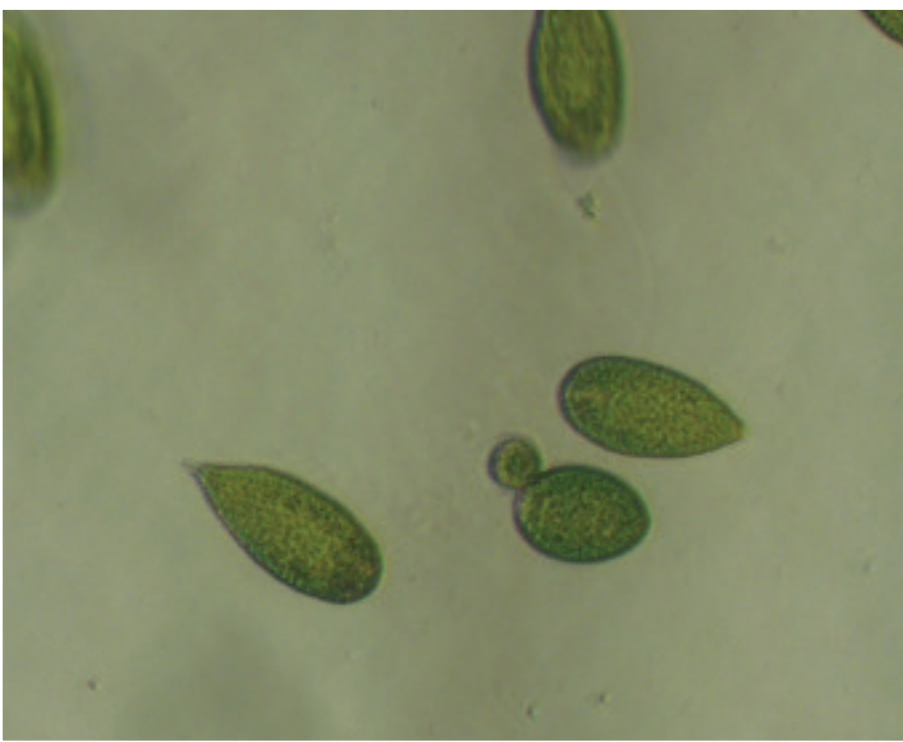
JOURNAL
Journal of Phycology

SIGNIFICANCE

- Raphidophytes cause massive fish kills and are a threat to both wild fish and net-pen mariculture.
- Broad salinity tolerance in *H. akashiwo*, and possibly other harmful raphidophytes, is a defensive adaptation that results in significantly lowered predation and, thus, enhances net population growth and bloom formation potential.
- Understanding the causes of blooms will lead to better prediction so that fish farmers can take appropriate remedial action.

SUMMARY

The ability of harmful algal species to form dense, nearly monospecific blooms remains an ecological and evolutionary puzzle. We hypothesized that predation interacts with estuarine salinity gradients to promote blooms of *Heterosigma akashiwo*, a cosmopolitan toxic raphidophyte. Specifically, *H. akashiwo*'s broad salinity tolerance appears to provide a refuge from predation that enhances the net growth of *H. akashiwo* populations through several mechanisms. (1) Contrasting salinity tolerance of predators and prey. Estuarine *H. akashiwo* from the west coast of North America had near maximal growth at salinities as low as 6, and distributed throughout experimental salinity gradients to salinities as low as 3. In contrast, survival of most protistan predator species was restricted to salinities >15. (2) *H. akashiwo* physiological and behavioral plasticity. Acclimation to low salinity enhanced ability to accumulate and grow in low salinity waters. In addition, the presence of a ciliate predator altered swimming behavior, promoting accumulation in low-salinity surface layers inhospitable to the ciliate. (3) Negative effects of low salinity on predation processes. Ciliate predation rates decreased sharply at salinities <25 and, for one species, *H. akashiwo* toxicity increased at low salinities. These behaviors and responses imply that blooms can readily initiate in low salinity waters where *H. akashiwo* would experience decreased predation pressure while maintaining near-maximal growth rates. The salinity structure of a typical estuary would provide this species a unique refuge from predation.



Raphidophytes

AUTHORS

C. H. Pilskaln, D.M. Anderson, D.J. McGillicuddy, B.A. Keafer, K. Hayashi, K. Norton (NOS/National Centers for Coastal Ocean Science)

PUBLICATION DATE

Available online November 2012

TITLE

Spatial and temporal variability of Alexandrium cyst fluxes in the Gulf of Maine: Relationship to seasonal particle export and resuspension

JOURNAL

Deep-Sea Research II. Topics on Oceanography. Population Dynamics of Harmful Algae and Toxin Food Web Transfer in Nearshore and Offshore Waters of the Gulf of Maine

SIGNIFICANCE

- The majority of *Alexandrium* cysts settle individually, rather than as parts of aggregates.
- At shallow depths the greatest flux of *Alexandrium* cysts originates from vertical sinking after blooms
- In deep water, the greatest flux of cysts is from resuspension from sediments, so the bottom nepheloid layer always has a high abundance of cysts.

SUMMARY

Quantification of *Alexandrium* cyst fluxes through the Gulf of Maine water column is central to understanding the linkage between the source and fate of annual *Alexandrium* blooms in the offshore waters. These blooms often lead to paralytic shellfish poisoning (PSP) and extensive closures of shellfish beds. Forecasts of the toxic Harmful Algal Bloom (HAB) species, *Alexandrium fundyense*, the New England red tide, are dependent on the annual maps of the distribution of seed like cysts in bottom sediments. It is unclear if the bottom sediments or the bottom nepheloid layer are the source of cysts that initiate blooms in the spring, but understanding cyst dynamics might improve HAB forecasts. The authors report on time-series sediment trap deployments completed at four offshore locations in the gulf between 2005 and 2010 as components of two ECOHAB-GOM field programs. At all sites, cyst flux maxima to the subsurface waters were rarely coincident with seasonal peaks in the total mass export of particulate material indicating that cyst delivery was primarily via individually sinking cysts. Where persistent benthic nepheloid layers (BNLs) exist, significant sediment resuspension input of cysts to the near-bottom water column was evidenced by deep cyst fluxes that were up to several orders of magnitude greater than that measured above the BNL. Temporal similarities between peak cyst export out of the upper ocean and peak cyst fluxes in the BNL were observed and document the contribution of seasonal, newly formed cysts to the BNL. The data, however, also suggest that many *Alexandrium* cells comprising the massive, short-lived blooms do not transition into cysts. Time-series flow measurements and a simple 1D model demonstrate that the BNL cyst fluxes reflect the combined effects of tidal energy-maintained re-suspension, deposition, and input of cysts from the overlying water column.

PRESS RELEASE

<http://www.sciencedirect.com/science/article/pii/S0967064512001889>

AUTHORS

William C. Holland, R. Wayne Litaker, Carmelo R. Tomasb, Steven R. Kibler, Allen R. Place, Erik D. Davenport, Patricia A. Tester (NOAA/NCCOS)

PUBLICATION DATE

December 2012

TITLE

Differences in the toxicity of six Gambierdiscus (Dinophyceae) species measured using an in vitro human erythrocyte lysis assay

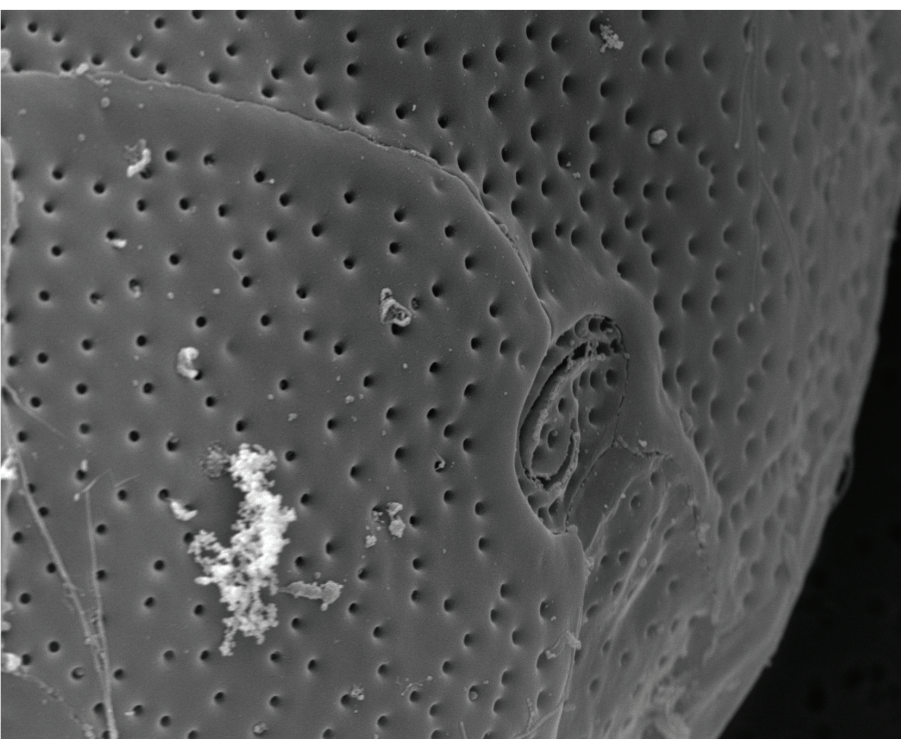
JOURNAL
Toxicon

SIGNIFICANCE

- Ciguatera fish poisoning (CFP) is the largest cause of nonbacterial seafood poisoning globally. CFP causes more human illness than all other algal toxins combined.
- Gambierdiscus species produce the toxins which cause ciguatera fish poisoning (CFP). This study found some species to be more toxic than others, that toxicity varied regionally, that toxicity increases under nutrient limitation, and that temperature did not significantly modulate toxicity.
- Our findings imply that much of this variability is due to differences in the dominant Gambierdiscus species present.

SUMMARY

Ciguatera fish poisoning is temporally and spatially variable. The results of this study will be used to inform models that predict regions where CFP is most likely to be a risk in the Caribbean and Gulf of Mexico, to assess the risk to food security in affected regions, to provide crucial information to manage fisheries where fish can become toxic, and to predict how CFP risk may vary with global climate change.



Gambierdiscus australes

AUTHORS

Kristen Crossett (NOS MBO Communications and Education Division); Brent Ache and Percy Pacheco (NOS MBO Special Projects Division), and Kate Haber (NOS IOOS Program)

PUBLICATION DATE

February 7, 2013

TITLE

National Coastal Population Report

SIGNIFICANCE

- In 2010, 123.3 million people, or 39 percent of the nation's population lived in Coastal Shoreline Counties – which account for less than 10 percent of the total U.S. land area, excluding Alaska – representing “the population most directly affected by the coast.”
- In 2010, 163.8 million people, or 52 percent of the nation's population lived in Coastal Watershed Counties – which account for less than 20 percent of the total U.S. land area, excluding Alaska – representing “the population that most directly affects the coast.”

SUMMARY

Since 1990, NOAA's series of coastal population reports (completed after each decadal census) have been used as an authoritative source for coastal population statistics. The 2013 report updates coastal population statistics using 2010 Census numbers and has been developed in close coordination with Census (more so than in previous iterations). The new Coastal Shoreline Counties / Coastal Watershed Counties reporting framework used in this report is intended to increase consistency in national-level coastal population reporting, and was developed in partnership with Census and FEMA. Regardless of how the coast is defined, it is substantially more crowded than the U.S. as a whole. For example, in 2010, the population density of Coastal Shoreline Counties was over six times greater than the corresponding inland counties. Increasing population density presents coastal managers with the unique challenge of protecting both coastal ecosystems from a growing population and protecting a growing population from coastal hazards.

The coast has grown at a slightly slower pace than the U.S. as a whole from 1970 to 2010. Population in Coastal Shoreline Counties and Coastal Watershed Counties has increased 39 percent and 45 percent, respectively, from 1970 to 2010, and over this same time period, the population in the U.S. as a whole increased 52 percent.



AUTHORS

Russ Green, Kathy Broughton, Steve Gitting (NOS ONMS)

PUBLICATION DATE

January 21, 2013

TITLE

Thunder Bay National Marine Sanctuary Condition Report

SIGNIFICANCE

- Designated in 2000, Thunder Bay National Marine Sanctuary protects a nationally significant collection of historic shipwrecks and related maritime cultural resources in northern Lake Huron.
- Through research, resource protection and education, the sanctuary works to ensure that these important historic, archaeological and recreational sites are preserved for current and future generations.
- The sanctuary serves as an anchor for heritage tourism, helping to attract businesses that have a positive impact on the local economy, and also supports a wide range of multidisciplinary research. The information provided will assist management of GRNMS and education and outreach staff in better understanding who their users are, what they care about, and how to improve communication with both users and non-users of Gray's Reef National Marine Sanctuary.

SUMMARY

This condition report does not directly address other aspects of the ecosystem (e.g., habitat and living resource quality). Exceptions, however, occur when there is a causal relationship between maritime archaeological resources and the ecosystem (e.g., the colonization of shipwrecks by non-indigenous mussels). Water quality issues are addressed in this report, but only where a nexus between shipwrecks and water quality could be identified (e.g., chiefly where poor water quality might prohibit public visitation of sanctuary resources). In general, water quality in the sanctuary as it relates to public access to maritime archaeological resources is considered to be good/fair. For the most part, changing or poor water quality is not an issue in Thunder Bay, nor is the resultant potential for decreased public visitation



Thunder Bay National Marine Sanctuary

AUTHORS

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PUBLICATION DATE

December 2012

TITLE

California Coastal Chinook salmon: status, data, and feasibility of alternative fishery management strategies

SIGNIFICANCE

- The ESA consultation standard for California Coastal Chinook frequently constrains ocean fisheries in CA and OR, and the PFMC has expressed substantial interest in exploring options for developing a new ocean fishery management strategy. This memo will likely play a significant role in future discussions regarding what changes to the current management strategy might be feasible.
- Low data quantity and quality leaves few options for the development of alternative fishery management strategies.

SUMMARY

The ocean fishery consultation standard for threatened California Coastal Chinook (CC-Chinook) salmon is specified as a cap on the preseason-projected age-4 ocean harvest rate for Klamath River fall Chinook (KRFC). Since the listing of the CC-Chinook Evolutionarily Significant Unit (ESU) under the federal Endangered Species Act in 1999, this consultation standard has frequently constrained ocean salmon fisheries in California and Oregon. Low levels of spawner and ocean fishery data have precluded development of a CC-Chinook-specific management strategy and necessitated use of the KRFC proxy. The purpose of this Technical Memorandum is to examine the spawner escapement and ocean fishery data that currently exist for CC-Chinook and address questions regarding whether there is now potential for the development of an alternative ocean fishery management strategy. At the current time, sufficient data do not exist to derive ESU-level estimates of spawner escapement. Recently collected genetic stock identification data from the ocean commercial fishery has allowed for inference about the ocean spatial distribution for CC-Chinook, yet these and other ocean fishery data are not sufficient for estimating total CC-Chinook ocean harvest. The current data are not sufficient to perform cohort reconstructions. Until more comprehensive spawner escapement and ocean fishery data are available, few prospects exist for developing management strategies that are based directly on CC-Chinook data.



California Chinook